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GEOGRAPHICAL RECORD.

AMERICA.

PROJECTED RAILWAYS IN CANADA.—Considerable interest attaches to the plan to extend the Grand Trunk Railway of Canada to the Pacific Ocean, its projected line being to the north of the present Canadian Pacific, and to build a new Trans-Canada road still farther north than the Grand Trunk extension. The high latitudes which these roads, especially the Trans-Canada, are to traverse, bring up the question of the climatic difficulties that may be encountered. While it is generally known that Manitoba is a fine wheat country, comparatively few persons yet realize the agricultural possibilities of the great Canadian West. One secret of the success of farming in the western provinces of Canada, east of the Rocky Mountains, lies in the comparatively high summer temperatures over a large portion of the district. During the summer months pretty uniform temperatures prevail in Alberta, the Peace River district, and northward almost to the Arctic Circle. In July the mean temperature at Winnipeg is 66° Fahr., and at Prince Albert 62°, the former being higher than that in any part of England. The average daily maximum temperature at Winnipeg is 78.1°, the minimum being 53.4°, and at Prince Albert the maximum is 76°, and the minimum 48°. It is these high day temperatures in summer, with abundant sunshine and, on the whole, sufficient and well-distributed rainfall, that cause the crops to mature so quickly. The northerly limit of wheat in northwestern Canada is about as far north of the projected Trans-Canada Railway line as that line is north of the international boundary. There is but little snowfall in winter; the warm chinook winds temper the cold near the mountains, and spring begins in the western districts earlier than in the eastern. The great "trek" of American farmers across the border into the Canadian West is recent evidence of the agricultural possibilities of these sections. Besides the grain, there are favourable conditions for cattle-raising, and in the mountains there are vast areas of woodland, as well as rich mineral deposits. The winters are long, but there is not much snowfall, and with plenty of sunshine and a clear, dry air during the colder months, together with a short but favourable summer for crop growth, the Canadian plains are not as inhospitable or as hopeless as they have sometimes been supposed to be. R. DEC. W.

River Surveys in the South.—A most useful geographical and engineering work has been recently begun by the Hydrographic branch of the United States Geological Survey. This is the making of a detailed combined topographic and hydrographic survey of the river systems throughout the United States. Already much related work has been done by the Army engineers below the *fall line* along the coastal borders and greater navigable rivers, in connection with river and harbour surveys. The present survey commences where these stop, and is carried through the Piedmont region and the interior of the country from the fall line to the headwaters of the larger branches.

The purpose is to make an exhaustive study of all those facts which are essential to a full knowledge of the nature, volume, and regimen of the streams, and their value as sources of water supply for power or domestic use. For a number of years past the Survey Bureau has maintained gauging stations, at which the daily and annual mean, maximum, and minimum discharge of the streams are being systematically measured. These results, supplemented by the Weather Bureau records of rainfall on the catchment basins of the streams, and a knowledge of their areas as measured from the topographic maps, furnish all the data from which to ascertain the available water supply of any stream at any time or place.

The additional work now being undertaken in the river surveys consists in making a large-scale contour of each stream bottom for a short distance only outside of the immediately confining banks, accompanied by a careful line of spirit levels. The results are plotted on maps having a scale of about three inches to one mile, with contours of ten feet interval. The profile of the surface of the water is plotted on a suitable scale, and the exact elevations at the tops and bottoms of all shoals, rapids, and falls are determined. Moreover, elaborate notes are made of the stage of waters, floodmarks, cultivated lands, and woods, the whole accompanied by numerous photographs.

As may be readily seen, the resulting maps and reports will furnish all the information necessary to an understanding of the possibilities of every stream in connection with the development of water resources of all kinds. The fall or slope shows the head available for power, and the volumes of flow are known. The maps indicate possible flats for water storage, as well as possible sites for diversion, storage, or mill dams, while photographs and notes give an idea of the topography and of the earth, rock, timber, and other materials of construction. H. M. W.

A HERD OF BISON IN NORTHWESTERN MONTANA.—The University of Montana, Missoula, maintains a Biological Station near Flathead Lake, in the northwestern part of the State. Professor Morton J. Elrod, Director of the Station, describes in *A Biological Reconnoissance*, published last year by the University, the herd of 220 buffaloes on the Flathead Indian Reservation. The herd, derived from 36 animals purchased in 1884 by Charles Allard and Michael Pablo, has in 20 years increased to more than 350, or ten times the original number. Many of the animals have been sold to show enterprises and to Eastern cities for parks and zoological gardens. The conditions here are more favourable for buffalo than in Yellowstone Park. The animals are constantly attended by a herder, and, therefore, are not afraid of man, while the Yellowstone Park herd is rarely seen.

The Park herd also ranges at a high altitude, over 7,000 feet, where snows are deep and winters are long and severe; but the Flathead herd ranges at an altitude below 3,000 feet, where deep snows do not occur, and hay or grain may be taken to the animals in a few hours. Their range does not exceed 70 to 100 square miles, and the animals might be maintained on a much smaller range. The cows do not bear calves until they are 4 or 5 years old, and about half of them produce every year. The fertility of the herd is not decreasing. The herder keeps note of the increase, looks after the calves, and, in fact, the animals are much more carefully attended than the range cattle among whom they graze.

Professor Elrod is of the opinion that the success of this private enterprise should stimulate Congress to increase its efforts to save the buffalo from extinction. An appropriation of $8,000 would buy as large a herd as Allard and Pablo purchased in the beginning. With the same care the herd should increase to between 400 and 500 in twenty years. If a tract of land containing from 50 to 100 square miles were set apart for a buffalo range, with an appropriation at the start of $15,000, and an annual appropriation of $5,000, there would be no difficulty in developing a herd that would be a credit to the nation. The care of the herd should be placed under the jurisdiction of the Biological Survey of the Department of Agriculture. It is hardly to be expected that the animals will thrive in Yellowstone Park, where the winters are long and severe, the summers short, and protection is afforded to wild animals, which prey upon the calves.

AFRICA.

MINERALS IN GERMAN EAST AFRICA.—Mr. Max Moisel has prepared a map of German East Africa on a scale of 1:2,000,000, showing the existing knowledge of its topography, and the distribution of useful minerals as far as they have been discovered. The map is reproduced on a smaller scale in the *Deutsche Kolonialzeitung* (No. 15, 1903). Placer gold has been found along the banks of some of the rivers, both near the south coast of Victoria Nyanza and between Lake Nyasa and the Indian Ocean. Among the Useraguru Mountains, near Emin Pasha Gulf, Victoria Nyanza, outcrops of gold-bearing quartz have also been discovered. It is expected soon to work some of the placer diggings. Iron is very widely distributed; excellent anthracite is found near the northern shores of Lake Nyasa, but beds of bituminous coal brought to light appear to be of inferior quality. Lead, copper, granite, kaolin, bitumen, mica, lignite, and agates are among other mineral resources which may some day prove profitable.

THE TUBURI SWAMP.—About half a century ago, Heinrich Barth discovered a widespread swamp to the west of Lake Chad which appeared to be so perfectly balanced on the water-parting that, in his opinion, it was drained partly into Lake Chad and partly into the Atlantic Ocean. This connection between the Chad and the Atlantic drainage system has now been proved to exist. The solution of the question has devolved upon the French expedition commanded by Capt. Loefler. Starting from Carnot, the chief station on the upper Sanga, he crossed the water-parting (850 metres above sea-level), between the Sanga, the Mobangi, and the Shari.

BIBLIOGRAPHY OF MOROCCO.—The exhaustive bibliography of Morocco to the end of 1891, prepared by Sir L. Playfair and Dr. R. Brown, and containing 2,243 titles (*Supplementary Papers* of the Royal Geographical Society, Vol. III, Part 3), is now supplemented by the bibliography attached to Mr. Camille Fidel's long paper "Les Interêts Economiques de la France au Maroc" (*Bulletin Trimestriel* of the Oran Geographical and Archæological Society, No. 94), in which he includes the most important works on Morocco since 1891—a period that has been peculiarly rich in literature on that country. Mr. Fidel's list embraces those books and papers which are specially valuable in an economic sense.

ASIA.

GERMAN COLONY OF KIAOCHAU.—Dr. Georg Wegener, in an article in the *Geographische Zeitschrift* (1903, No. 4), says that the harbour of Kiaochau Bay does not fill all desirable conditions. The bay is so large that the northwest storms, frequent in winter, endanger the shipping. This difficulty will be obviated, however, by the completion of the mole, which will be 4½ kilometres in length, 5 metres in width, and 5 metres above high tide. Under the protection of this mole two havens are being built. The smaller has, in fact, been completed, and is now utilized by vessels drawing not more than 5 metres. The larger, adapted for the greatest ocean vessels, is nearing completion. The dry dock, which will be the largest on the east coast of Asia, will be ready for use in 1904. The bay is undoubtedly the best harbour north of the Yangtse; but its potentialities for fostering the growth of trade are latent, and must be developed by the great commercial Power that now holds it. Trade with the populous interior will be created chiefly through the railroad now building from the Bay to western Shantung. Great improvements have been made at Tsingtau, the starting-point of the railroad, and the port of the Bay. Wide, well-built streets, commodious dwellings and business houses, and healthful barracks for the troops have been constructed. A large lighthouse is building at the entrance to the Bay.

AUSTRALIA.

THE PROPOSED TRANS-CONTINENTAL RAILWAY IN AUSTRALIA. —The projected railway across Australia, from Adelaide on the south to Port Darwin on the north, a distance of 1,896 miles, is to cut right through the central portion of the country, and is one of the many interesting railway enterprises of the present day. On the south the railway now reaches Oodnadatta, 683 miles north of Adelaide, and on the north it is built from Port Darwin to Pine Creek, a distance of 145 miles. As to the climatic conditions of the great interior district which is to be traversed, very little is known. It used to be thought altogether a hopeless desert. Then came reports that the climate around the MacDonnell Range was "splendid" and the country very fertile. Later, the Horn Expedition resulted in modifying the too favourable opinion which had been formed by the natural reaction from the earliest ideas. Horn found the ranges bare ridges, separated by sandy flats. In 1862, McDouall Stuart made his third, and successful, attempt to cross the continent from south to north. He found that the Bonney River, in latitude 20° 24′, which when last seen in March was a fine stream, in September was a series of water-holes. The tracks of the expedition of the previous year were plainly visible, which showed that no rain had fallen in the meantime. Central Australia evidently shares with other arid regions the characteristic of having great irregularity of rainfall from year to year. The MacDonnell Range receives occasional heavy showers, which fill up the streams and even flood the lower country. When a traveller comes at such a time he finds a luxuriant growth of vegetation; while one who comes later or earlier may take back a very different story. Over the central portion of the route to be traversed by the railway the rainfall may average about five inches a year; but towards the northern end of the line, in the. Northern Territory proper, or Arnhem Land, there is more rainfall and a possibility of vast wealth. In the north, rice, sugar-cane, tobacco, and coffee flourish; while to the south the greater part of the country is suited for breeding sheep, cattle, and horses. It has been stated that the country may be expected to carry 30,000,000 sheep. In supporting the railway bill, the Premier of Australia recently said: "The territory is bound to became the great cattle-producing country of the world; no other part is so suitable for cheap and extensive production."

R. DEC. W.

CLIMATOLOGY.

CLIMATIC CONTROL OF RAILROAD CONSTRUCTION AND OPERATION.—In the construction and operation of railroads in different parts of the world, many of the chief difficulties encountered arise from the climatic conditions of the regions traversed. Some of these difficulties, and the way in which man has met them, are considered in a recent article on *Climatic Factors in Railroad Construction and Operation*, by Robert M. Brown (Journ. Geogr., April, 1903, 178–190). The railroad districts of the world are classified by the author into Regions of Heavy Precipitation; Regions of Moderate Precipitation; Regions of High Altitudes, and Regions of Severe Winters. In the first of these districts, where the rainy seasons usually alternate with dry seasons, much trouble arises from the fact that the ties decay, and have to be preserved by creosoting, or else must frequently be renewed. In any case the expense involved is very considerable. During the dry season the hot sun may warp and split the sleepers so that they must be renewed, and there is also difficulty in supplying the labourers with pure water. Early in the history of the Sind Railway, in India, a system of water-carts and bullocks, and later of water-trains, was organized for carrying drinking water to the men. The scanty supply of pure water for use in the locomotives is another serious handicap. The number of working days is much decreased by the heavy rainfall of the wet season and by the excessive heat of the dry season. In the construction of one road in India work was impossible between 9 A.M. and 4 P.M. During the rainy season "the history of every road that traverses the belt of heavy precipitation is a story of continued struggle against flood" and landslides. In Ceylon a rainfall of 28.56 inches in eleven days caused so many landslides near Nanu that traffic was interrupted for six weeks, and the La Guayra and Carácas Railroad, in Venezuela, is frequently similarly blocked during the rainy season. On the other hand, in the dry season much difficulty has been experienced because of the damage to machinery and bearings through dust.

Regions of light precipitation, which include the deserts of the world, present climatic problems to the engineers which are often very difficult to solve. The great danger from fire in the case of ties, bridges, and buildings often necessitates fire stations and fire patrols. Water has to be carried or piped for long distances, as in the case of the Southern Railway of Peru and of the Iquique Railway of Chile. Work has often to be suspended during the noon hours. The absence of wood and coal for fuel has, in several cases, led to the use of oil. Blowing sand covers the tracks, and necessitates the employment of labourers to keep the road cleared.

In regions of high altitudes there are the difficulties which arise from mountain sickness and from the cold, both during the construction and after the completion of the road. A part of the new Jungfrau Railway is run through a tunnel to protect it from the winter snow blockades, which are serious handicaps to many railroads. It cost the Colorado Midland Railroad $60,000 to clear its track of snow during the late winter of one year recently.

The Trans-Siberian road is a good example of a railroad built in a region of severe winters. Temporary rails were laid on the ice during the period of construction, and ice-breakers have been employed to keep Lake Baikal open, so that the cars may be ferried across.

R. DEC. W.

LONDON FOGS.—Captain Alfred Carpenter, R.N., who has been conducting the official inquiry into the occurrence and distribution of fog in London, has presented a report to the Meteorological Council of the Royal Society on the results obtained for the year 1901–02. Among the most important conclusions thus far reached are the following: The commencement of a fog is a general process, depending upon general atmospheric conditions. There is no evidence that fogs formed outside invade or drift into London. London fogs are produced in London. During dense fogs in London there is a tendency to an indraught of air from all sides to the central parts of the city. No severe fog occurred with a temperature above 40° Fahr. On March 7, during a fog, the temperature in the streets was nearly 10° Fahr. below that on the roof of the Meteorological Office, at the elevated stations, and over the surrounding country on the south and west. It is proposed to carry on the investigation, and especially to study the vertical decrease of temperature before and during fogs. R. DeC. W.

PHYSICAL GEOGRAPHY.

VOLCANIC ERUPTIONS IN SAMOA.—The German Government received, in February, official and private accounts of the volcanic eruptions which began in Savaii, the largest and most western island of the Samoan group, in October last. Dr. Georg Wegener, of Berlin, has an article based on these reports in the *Zeitschrift* of the Berlin Geographical Society (No. 3, 1903), from which the following facts are taken:

The eruptions were a great surprise to the islanders; though the entire group is formed of volcanic outpourings, excepting the little atoll Rose and a number of coral reefs, no evidences of existing energy at the present time were known. There were no solfataras, fumaroles, or hot springs to show that plutonic energy was not entirely extinct. Since the recent outburst a half-forgotten tradition has been revived, to the effect that long ago, perhaps about 1690 A.D., a very severe eruption on Savaii destroyed ninety-five villages. This story must, however, be received with reserve. It is evident that vulcanism in the archipelago gradually subsided from the east to the west, the eastern islands being evidently older than those in the west. In the Manua and Tutuila groups (United States) of the east, for example, the ancient craters have entirely or to a large extent disappeared through denudation, while in the western island of Savaii well-formed craters still remain. The larger denudation and the formation of humus in the eastern islands have also resulted in a deep rich soil, while in Savaii a great part of the island is not adapted for tillage. These facts are interesting to us in their bearing upon the non-liability of our island Tutuila to suffer from such disasters.

The news of the eruption was brought to Apia, the capital of German Samoa, on Upolu island, on November 2, by an English-man named Williams, who crossed from Savaii in an open boat. He said that severe earthquakes, which overturned stone walls, were felt on the north coast on October 29th. "Smoke" was seen to be rising above the interior mountains on the 30th, and that night subterranean rumblings were heard. These phenomena continued up to the time that Williams left the island. Dr. Schnee, Governor of German Samoa, and Dr. Tetens, the astronomer, went to Savaii on November 3d. That evening they observed flames rising to a height of 100 to 200 metres about 17 miles southwest of south from Mataatu, the chief town of the island on the northeast coast. The natives along the north coast had been greatly alarmed, and most of them fled to the east.

On November 7th a very severe earthquake occurred, which badly damaged several Mission churches in Safune and Sasina, on the coast, and destroyed the village of Paia. On the same day Dr. Tetens, in the midst of a hard rain, pushed inland, and on the following day he camped, at a height of 1,460 metres above the sea, in the neighbourhood of Manga Afi, a long-extinct volcano, within plain view of the column of dust and fire-glow that was rising above the trees. The seat of the explosion was on the slope of Manga Afi, about 50 metres below the old crater at its summit, and about three-fifths of a mile from it. The ascending dust column varied in strength from time to time. Glowing bodies at very frequent intervals were ejected to a height of about 100 metres, most of them falling back into the opening. The scene did not give an impression of great energy. The crater edge could not be seen on account of the burned timber around it. A remarkable discovery was made about 3 kilometres northwest of the crater. A rough wall or ridge of pumice-like stone, measuring from 10 to 50 centimetres or more, and still so hot that the barefooted Samoans could not step on it, rose to a height of 5 to 10 metres. This "stone stream," which undoubtedly came from the new crater, and was about 150 metres lower down the slope, was from 5 to 10 metres in height. Its width and length were not ascertained. No flowing lava was observed.

On November 18th, Surveyor Lammert approached the centre of disturbance from the south side of the island, and found another active crater from 600 to 800 metres southwest of the one which Dr. Tetens had discovered. He also found that the crater which Tetens approached had an east-west axis 800 to 1,000 metres in length. Through five or six cracks in the surface of the slope, also, little shoots of flame rose to a height of only one to two metres. The air at times was so charged with gases that it was difficult to breathe. All vegetation had been destroyed near the craters, and the forests were burning for a considerable distance around. Herr Lammert was not able to reach the crater he had discovered, but saw that its activity was increased after a sharp earthquake shock.

No further news has been received. Dr. Wegener is of the opinion that the eruptions have subsided, or at least have not intensified, for otherwise vessels arriving in Australia or San Francisco would have reported the fact. He calls attention to one interesting feature. It is generally supposed that the degree of energy displayed by a reawakened volcano is proportioned to the length of its period of rest; the longer the period, the more violent the outburst when it comes. In Savaii, however, though apparently no volcanic outburst had occurred for some centuries, the energy of the recent eruption has been comparatively unimportant; the subterranean power seems to have found some easy way to reach the outer air.

FORMATION OF BARRIER REEFS AND DIFFERENT TYPES OF ATOLLS.—Professor Alexander Agassiz has summarized his results, based upon observations of barrier reefs and atolls, carried on during the past twenty-five years, for the *Proceedings* of the Royal Society (No. 474, 1903). He recognizes the fact that Darwin's theory does not explain the conditions now observed, but limits his report to descriptions of the different types of coral reefs and of their probable causes, without attempting to establish any independent theory. He has found that the barrier reefs of Fiji, Hawaii, and the West Indies are underlaid by volcanic rocks and usually flank volcanic islands. Those of New Caledonia, Australia, Florida, Honduras, and the Bahamas are underlaid by outliers of the adjoining land masses. Some of the barrier reefs of the Society Islands, Fiji, and the Carolines show that the wide, deep lagoons separating them from the land mass were formed by erosion from a broad, fringing reef flat. Encircling reefs, as in the Society Islands, hold to their central island or islands the same relation which a barrier reef holds to the adjoining land mass. Denudation and submarine erosion account for the formation of platforms upon which coral and other limestone organisms may build either barrier or encircling reefs, or even atolls rising upon a volcanic base.

We may trace plateaux that have been elevated, like Guam, partly volcanic and partly limestone, to atolls where only a small islet or a larger island of either limestone or volcanic rock is left to indicate its origin. Atolls may also be formed upon the denuded rim of a volcanic crater, as at Totoya, in Fiji. Many of the atolls in the Pacific are merely shallow sinks formed by high sandbanks thrown up around a central area. Throughout the Pacific, the Indian Ocean, and the West Indies the most positive evidence exists of a moderate recent elevation of the coral reefs. Closed atolls can scarcely be said to exist; Niau, in the Paumotus, is the nearest approach to one, yet its shallow lagoon is fed by the sea through its porous ring. The land area of an atoll is relatively small compared with that of the half-submerged reef flats. In the Marshall Islands and the Maldives, for example, the land areas are reduced to a minimum. Atolls may rise from a platform of suitable depth wherever and however it may have been formed and whatever may be its geological structure. The great coral reef regions are within the limits of the trades and monsoons and the areas of elevation, with the exception of the Ellice and Marshall Islands and some of the Line islands. Corals have their fullest development on the sea face of reefs; they grow sparingly in lagoons where coralline algæ grow most luxuriantly. Nullipores and corallines form an important part of the reef-building material.

ECONOMIC AND COMMERCIAL GEOGRAPHY.

WESTERN MOVEMENT OF COAL IN THE UNITED STATES.—In the entire region between the Appallachian coal field and the Rocky Mountain fields a general Western movement of the coal is observed. Thus the product of the Western Interior field (the coal-belt from north Iowa to central Texas) goes West almost exclusively; that of the Eastern Interior field (portions of Indiana, Illinois, and Kentucky) goes West to and within the borders of the Western Interior field, while the Appalachian coal goes west across both the Eastern and Western Interior fields and beyond the territory of the latter, competing with the Rocky Mountain coals to some extent. This westward tendency is due chiefly to the higher grade of Eastern coal; in part, also, to the fact that railroad freight rates are generally lower westward than eastward; water transportation also favours the westward rather than the eastward movement of coal (*Contributions to Economic Geology. 1902. Bulletin* No. 213, United States Geological Survey).

HENEQUEN IN YUCATAN.—Consul E. H. Thompson, of Progreso, Yucatan, contributes to *Advance Sheets* of the Consular Reports (Feb. 28, 1903) an interesting account of the chief product of

Yucatan. Sisal grass, sisal hemp, henequen, or simply sisal, are names applied to a fibre that is neither a grass nor a hemp, and is not produced to any extent in Sisal. The name sisal was given to it because, until 1871, Sisal was the only port through which it was exported. When a railroad built to Progreso gave a shorter route to the coast, the exports were entirely transferred to that port. Its wharves are now lined with shipping, and the streets are filled with bales of henequen ready to be sent out in exchange for the general merchandise that comes in. The *Agave americana* produces the pulque, which is the national beverage of Mexico. Another member of the agave family, the *Agave sisalensis*, supplies the fibre which is so widely used in our country for cotton sacking, binders' twine, rope, and other articles. The cultivation of henequen was not important till the invention of fibre-cleaning machinery. With the aid of one machine two men can now clean more fibre in a day than forty were formerly able to do. There are five different machines, each of which can strip the fibre from 150,000 agave leaves in ten hours. The output has steadily increased for ten years, and amounted in the fiscal year ending June, 1902, to 564,308 bales.

BRAZIL RUBBER.—Mr. A. Kähler, who has spent five years on the Amazon, gives an interesting account in *Petermanns Mitteilungen* (February, 1903) of the methods of collecting rubber in the forests of Brazil. Rubber of the best quality and largest quantity comes into the trade under the name of Pará rubber or Pará-fina. The tree from which it is derived (*Siphonia elastica*) is widely spread over the lowlands, and thrives best where the land in the rainy season is almost completely flooded. It has a straight, silver-coloured trunk, and attains a height of 60 to 80 feet. The collector requires about two hundred trees, collecting sap from half of them on one day and from the other half on the day following, thus alternating through the season, which covers the drier months from May to October. The workman goes from tree to tree, making short incisions through the bark with a small hatchet. Under each incision he presses into the bark the sharp lip of a tin cup, which catches the sap. The incisions close completely in about two hours, when the cups are collected and the sap is carried to his hut. The afternoon is given to smoking and coagulating the morning's collection. The average amount gathered by a collector in the season is from 400 to 500 kilograms, which usually sells in Europe for about $1.85 a kilogram. There is scarcely any vegetable product that brings so high a price as Pará rubber. It is usual to give the *siphonia* a rest of a year after it has yielded annually for four or five years. Plantations for the cultivation of this tree have been started, but the cultivated *siphonia* seems to yield less sap than the wild tree; and the product is of poorer quality. The other variety of Brazilian rubber is extracted from the caoutchouc tree, also widely distributed; it seems likely to be exterminated, because the tree must be destroyed to obtain the sap. The milk runs so rapidly that no way has yet been discovered of collecting it while the tree is standing. The *siphonia*, on the other hand, may be counted upon as a great and permanent resource.

LIVE STOCK IN GERMANY.—The following figures, condensed from a table in *Vierteljahrshefte zur Statistik des Deutschen Reichs* (Ergänzungsheft zu 1903), show the number of live stock (the larger classes) in Germany in three census years; the decline in the sheep industry has been very marked:

	1873.	1892.	1900.
Horses.......	3,352,231	3,836,273	4,195,361
Cattle........	15,776,702	17,555,834	18,939,692
Sheep........	24,999,406	13,589,662	9,692,501
Swine........	7,124,088	12,174,442	16,807,014
Goats	2,320,002	3,091,508	3,266,997

FREIGHT HAULAGE IN MADAGASCAR.—The excellent wagon roads, completed in 1901, between Antananarive, the capital of Madagascar, and the ports of Tamatave, on the east, and Majunga on the west coasts, have revolutionized the methods of freight carriage. Human porterage has been almost entirely supplanted by freight wagons hauled by men. In the last six months of 1902, 4,026 freight wagons were hauled to Antananarive by 11,831 men, all but 156 wagons starting from Tamatave. In the same time only 505 porters carried loads between the sea and the capital, though, in 1901, 48,600 men were engaged in the porterage service. The economy of the new method of carriage is illustrated by the fact that the freight in 1902, carried by wagons hauled by 23,590 men, would have required 62,418 men to carry it on their backs. Haulage by mules and oxen is still small, but is increasing (*Bulletin Économique*, No. 4, 1902).

MANUFACTURING INDUSTRIES IN SWEDEN.—From 1896 to 1901 the number of manufacturing establishments in Sweden increased from 8,812 to 10,904; of workpeople in them from 202,293 to 262,229; and the total value of the product from $192,487,400 to

$285,010,200. Saw mills contributed, in 1901, 13.53 per cent. of the total value of product; flour mills, 7.70 per cent.; textile mills, 5.22 per cent.; machine shops, 5.14 per cent., and iron and steel manufactures and foundries, 5.01 per cent. (*Bidrag till Sveriges Officiela Statistik.* Fabriker och Handtverk, 1901).

THE WORLD'S CEREAL CROPS IN 1902.—The world's yield of cereals in 1902, as estimated by *Broomhall*, was: Wheat, 3,072,000,000 bushels; maize, 2,975,000,000; oats, 3,172,700,000; barley, 1,027,100,000; rye, 1,518,000,000. The United States produced 84 per cent. of the world's maize and 22 per cent. of the wheat. Russia produced 40 per cent. of the barley and 55 per cent. of the rye.

MAPS AND CHARTS.

THE BEST MAPS.—Professor Israel C. Russell, of Michigan University, gave an address before the Michigan Academy of Science, at its ninth annual meeting, on topographic maps and the topographical survey of Michigan. He said the most enlightened nations of Europe are in advance of all others in the completeness and accuracy with which their domains have been surveyed and mapped. Germany, France, and England, in particular, have excellent maps of their territory, and, in many instances, most conspicuously in the case of the English in India, the same desire for accurate information has been extended to their colonial possessions. Similar maps embracing any considerable areas in America were almost unknown up to the organization of the United States Geological Survey in 1879. Even at the present time creditable maps of the entire area of only four States are at hand; and in Michigan less topographic work has been done than in any other State, with the exception of Florida and Minnesota.

These best maps, in addition to representing the relative positions of objects on the earth's surface, indicate with equal accuracy the heights and shapes of mountains and hills, the forms of valleys and the slopes of their enclosing uplands. In brief, such maps represent portions of the earth's surface, in three dimensions, by means of three co-ordinates—namely, latitude, longitude, and height above or depth below sea-level.

Professor Russell described contoured topographic maps, their advantages and uses, and enlarged upon the need of them as the basis for carrying out a wide range of enterprises. Several States, for example, ignored the fact that the results of geological surveys may be accurately laid down only upon a topographic map, with the result that their geological work was in large part provisional and in most cases re-surveys became imperative, and thus much time and money were wasted. Speaking of the topographic survey of Michigan, he quoted Mr. C. A. Davis, who had made a preliminary study of the forest preserves of the State, and said that the existing maps, with the exception of those of small areas produced by the United States Geological Survey, were so inaccurate that they gave none of the data demanded, even for the intelligent location of a farm or a forest.

If Professor Russell's address were read by a large number of our people it would help to create the public sentiment, which is sorely needed, to influence our private map houses to improve the quality of their maps, in which respect this country now lags wofully behind all the other leading nations of the world.

PILOT CHARTS OF THE SOUTH ATLANTIC AND SOUTH PACIFIC OCEANS.—The monthly Pilot Charts of the North Atlantic and North Pacific Oceans, issued by the United States Hydrographic Office, are well and favourably known to seamen of all nationalities. They present, from month to month, the latest and most accurate information obtainable regarding winds, fog, ice, storm tracks, wrecks, etc., over these oceans. From year to year these charts have been improved and have become more valuable. Within a few years the British Meteorological Office began to issue similar charts for the Atlantic Ocean. Information now comes from the United States Hydrographic Office to the effect that it is proposed to publish charts of the South Atlantic and South Pacific Oceans, similar in scope to the present North Atlantic and North Pacific charts. The proposed charts will be published quarterly instead of monthly, the first to appear being the South Atlantic chart for the winter months of 1903–04, which it is hoped to have ready for distribution November 1, 1903. Successive seasonal charts of the South Atlantic will appear at quarterly intervals until the first year has been completed. Then the series for the South Pacific Ocean will be begun.

R. DEC. W.

GENERAL.

THE NINTH INTERNATIONAL GEOLOGICAL CONGRESS.—The next meeting of this Congress will be held on August 20–27, inclusive, in Vienna. The president of the committee in charge is Dr. Emil Tietze, Director of the Imperial Geological Office; the Secretary is Prof. Dr. C. Diener. The proceedings will include three principal topics: 1. The present standpoint of our knowledge of crystalline schists, with papers by Profs. F. Becke, C. van Hise, P. Termier, F. E. Suess, A. Sauer, J. Sederholm, and L. Mrazec. 2. The Problem of Over-thrusts, with papers by Profs. V. Uhlig, M. Lugeon, F. Törnebohm, Bailey Willis, and F. Kossmat. 3. The Geology of the Balkan Peninsula and the Orient, with discussion by Profs. F. Toula, V. Hilber, J. Cvijic, G. v. Bukowiki, F. Katzer, and A. Philippson. Other papers of general interest and the reports of various scientific commissions are included in the programme. A number of very interesting excursions have been planned, including visits to the paleozoic region of central Bohemia, the thermal zone, and the eruptive districts of north Bohemia, the petroleum fields of Galicia, the salt regions of Salzburg, the Iron Gates of the Danube, Belgrade, and other points of interest, as well as short excursions during the sessions of the Congress to the environs of Vienna. The complete programme, with approximate estimate of the cost of excursions, may be obtained by applying to Prof. Dr. C. Diener, Vienna 1, Bartensteingasse 3 (*Petermanns Mitteilungen*, No. III, 1903).

DR. NEUMAYER RETIRES.—Dr. G. V. Neumayer, the well-known meteorologist and geographer, on April 1 gave up the directorship of the Deutsche Seewarte at Hamburg, of which he had been in charge since 1876.

DEATH OF. DR. GUSTAV RADDE.—*Globus* (16, 1903) reports that Dr. Gustav Radde died at his home in Tiflis on March 16th last, in the 72nd year of his age. He was specially distinguished for his numerous contributions to the geography of animals and plants. His studies and explorations took him over a large part of north and central Asia, the Caucasus, and, to some extent, into tropical Asia. His greatest work was the founding of the Museum of Natural History, Ethnology, and Antiquities at Tiflis. He wrote a number of books, and was a frequent contributor to *Petermanns Mitteilungen* and its Supplements.

THE LARGEST VINEYARD IN THE WORLD.—*La Géographie* (April, 1903), in an article on "Agricultural Economy in Portugal" by M. Ch. Flahault, prints a striking view of the largest vineyard in the world, at Poceirao. It contains 2,400 hectares (5,930 acres), on which are planted 6,000,000 vines, annually producing more than 100,000 hectolitres (about 2,650,000 gallons) of red and white wine.